Frost Canker of Picea sitchensis (Trautv. et Mey.), the Menzies Spruce.

BY

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With Plate LI.

The Menzies spruce was introduced in 1831 by Douglas, and as a timber tree it was a very valuable addition to our forest flora. It is one of the many conifers introduced from Western North America. In horizontal distribution it ranges between Northern California and Alaska, and is especially abundant on the island of Sitka. In vertical distribution it ascends to an altitude of 7000 feet in the Rocky Mountains.

Authorities both in this country and on the Continent agree that the Menzies spruce is an exotic conifer which has proved itself to be well worthy of cultivation as a forest tree for profit. Dr. Nisbet states that—"With the sole exception of the larch, this tree and the Douglas fir (but especially the latter) are probably the most important coniferous timber trees that have ever been introduced into Britain. They are certainly the most important introduced from North America at any time, and the most important trees introduced into Britain during the nineteenth century."[1]

At the beginning of October of 1908 I received a number of specimens of diseased Menzies spruce from an estate in Ayrshire. My correspondent, in his letter, says:—"The trees were planted about three years ago in order to fill up the vacancies in a fifteen-year-old plantation of Scots pine, larch, and spruce. I was particularly struck by their fine appearance last year, and was very pleased to think the soil would be completely covered in a year or two, but in the early part of last summer I was much disappointed to find about two-thirds either dead or dying. The severe frost we experienced in the

[1] The Forester, 1905, Vol. I., p. 242.

middle of April may have been the primary cause, but there is little doubt something more serious is at work now." I have seen since these plantations, and can vouch for my correspondent's statement that at least two-thirds of the plants are infected ; I should say more, in fact, in the plantations shown to me I was unable to find a single perfectly healthy specimen.

In the month following (November) I received from another estate, this time in Argyllshire, a consignment of Menzies spruce similarly affected. My correspondent here also gives a similar account. He says :—" There is apparently a fungus, but possibly the trees are predisposed to attack by frost. I have planted this tree rather extensively, as it grows fast here, often three or more feet in a season. This disease has been noticed for the last two or three years, but only on a very small scale. This year, however, thousands of trees are affected in all situations and varieties of soil, though it is worst in the hollows and least in airy situations. In nearly all cases the second year's wood is affected, and all above that dies off. The lower part of the tree remains vigorous and fresh looking, and quickly throws a new leader or leaders. This year we had a severe frost, 10 to 15 degrees, on two nights in May."

Since then still another inquiry, accompanied with specimens showing identical symptoms, has come in to me from Perthshire.

Evidently there has been widespread damage to the Menzies spruce. In all cases the young trees after a period of very promising growth suddenly collapsed. The first sympton of attack is apparently a striking change in the colour of the foliage, which loses its dark green and becomes pale yellow. Next, the leader loses its leaves and usually turns dark red in colour, and its side buds, or branches, are arrested in their growth. The needles are usually retained on the older parts, and if the tree is not killed outright an attempt to replace the leader by a side branch is made. Figure 1, Plate li., shows this condition of affairs. The end of the leader was, however, cut off for convenience in transport before the specimen was sent to me. The tip was, however, in the same state as the basal portion. The stem in many cases was found to be cankered. The first indication of this is a slight flattening at one or two points accompanied by an outflow of thin bluish-white resin which makes conspicuous the cankered spots. Later the bark splits, exposing the wood, and an attempt is made by the tree to cover these exposed areas by

a callus formation. Figure 1 shows a cankered portion with the split bark on a three-year-old stem. Figures 3 and 4 show a characteristically cankered stem from both sides. The plastic material coming from the whorl branches nourishes the living tissues and stimulates callus formation where splitting has taken place, and this results in the swollen portions (very well seen in Figure 4) at the base of the living branches.

An anatomical examination of the tissues leaves little doubt that frost is the primary cause. Dead branches were only found on trees which showed canker, and the canker seems to occur invariably lower down on the tree where the parts are two or more years old.

The fructifications of an ascomycetous fungus are invariably present, and this may have something to do with the malady, but it will require further investigation to settle this point. The appearance of the fungus fructifications dotted over the surface of the stem above the whorl of branches is seen in Figure 2.

Apparently other conifers have been attacked in a similar way. Early in October Mr. Leven, head forester to Mr. Oswald of Auchincruive, Ayrshire, and a former member of the staff of the Royal Botanic Garden, sent a branch of Douglas fir which shows the fructifications (apothecia) of an ascomycete apparently similar in every way to those on the Menzies spruce and, as will be seen from the photograph of this specimen, Figure 5, the splitting of the stem with the subsequent callus formation agrees exactly with what takes place in the Menzies spruce.

Quite recently I have seen in Perthshire many young Douglas firs, and also a specimen of Abies nobilis, which showed identical symptoms to those above described.

EXPLANATION OF THE FIGURES IN PLATE LI.

Illustrating Dr. Borthwick's paper on "Frost Canker of Picea sitchensis, the Menzies Spruce."

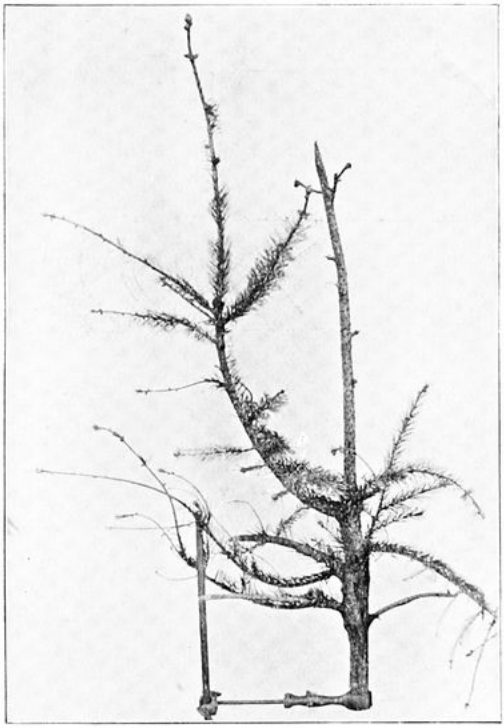
FIG. 1. Apical portion of young Menzies spruce, showing the dead leader replaced by side branch, and also, below it, the cankered portion of stem.

FIG. 2. Portion of stem showing the fructifications of an ascomycetous fungus.

FIG. 3. Portion of a cankered stem showing splits in bark with subsequent callus formation and swellings below the branch whorls.

FIG. 4. The same specimen as in Fig. 3, but seen from the opposite side.

FIG. 5. Branch of Douglas fir, showing symptoms similar to those in Menzies spruce.



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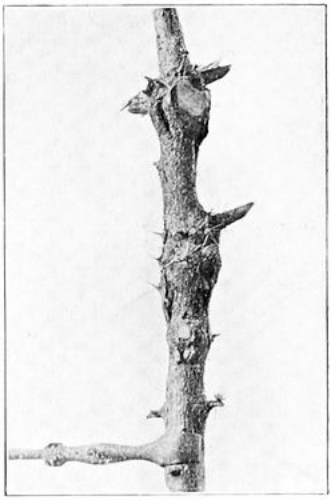

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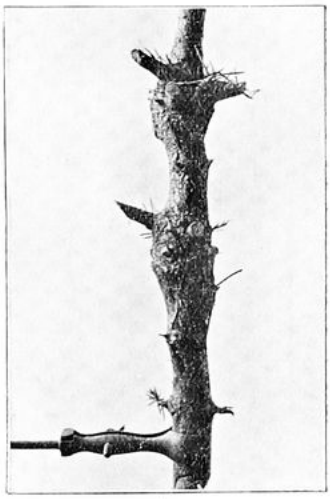

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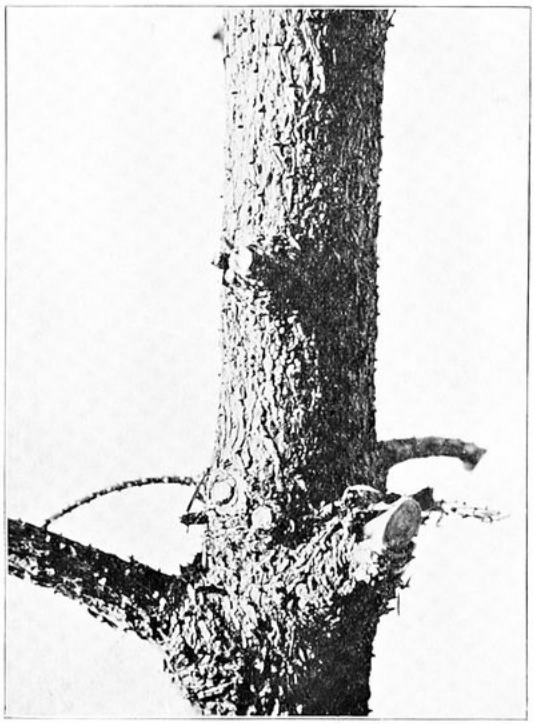

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Borthwick—Frost-canker of Picea sitchensis, Trautv. et Mey.